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ABSTRACT

This paper concerns the use of the computer in schools. Several specific operational computer applications useful to counselors are discussed. These are: (1) the Ventura, which is the most comprehensive system; (2) the services available from NEEDS; (3) course selection; (4) updating information; and (5) making decisions, particularly occupational choices. Computer assisted guidance and counseling supports and supplements what the counselor does. However, some problems may arise due to the use of computers: (1) impersonal feelings; (2) high cost; (3) the system needs to be tailor made for each local area; and (4) the negative attitudes of teachers toward such technology in education. (EK)

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WHAT COMPUTERS CAN DO NOW[1]

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This paper is concerned with the use of the computer in the schools as it now exists. I'm considering systems which are now operational; I'm not reviewing systems for counseling which have only been proposed or are in an early stage of development. You can read about these in Scates (1969).

One of the more important concepts basic to the understanding of a computer is the concept of machine readable information. The computer card is most widely known right now. With its punched holes, it can be 'read' as it is fed between a metal roller and electric brushes. These are connected to electric circuits which are typically integrated with electromagnets which then do things depending on the pattern of impulses they get from the pattern of holes in the card. The machines that rearrange and/or process these cards, physically and sequentially, are called 'unit record equipment' and are relatively awkward to use. Such machines as the printer, sorter, collator, and reproducer are in this category.

The computer is distinctly different in that it can store the information in its magnetic memory through electrical impulses. This gives the options of accessing the information at random rather than sequentially, and data can be processed in a series of specified sequential steps. For example, information can be mathematically manipulated, or it can be printed out in a new order and in a specified format.

Computers can do many things which I'm sure you're aware of, some of which are rather glamorous and well known. I'll mention a few in passing, and describe in more detail some uses specific to education and counseling.

Computers can run production machines, or even a whole assembly line, coordinating all branches so that a specified combination of parts come together for final assembly.

Computers can keep track of all the variables on a trip to the moon, counter-balancing automatically for weaknesses in a particular part or function of the moon rocket.

Computers can record data for large numbers of males and females, and match (or mismatch) characteristics for compatibility as desired. This is Operation MATCH.

A computer can remember a researcher's 'profile' of interests, and notify him of all articles matching part or all of his profile, in the particular journals he selects. This information retrieval system is run by the Technical Information Dissemination Bureau, University of Buffalo, and it even keeps track of chapters in books. It can respond to a literature search request on a given topic and list a relevant chapter of a book in the resulting bibliography, even though the book itself isn't generally relevant.

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[1]Paper presented in "Computer Applications to Counseling," a panel presented at the annual meeting of the New England Educational Research Organization, Boston, June 4-5, 1970.

The computer can do numerical analyses of all kinds.

It can even analyse sections of verbal material. For example, a TAT protocol (Stone, 1968), an essay (Page, 1967), or a counseling interview (Iker & Harway, 1966).

In the educational field, the computer can do something so nitty-gritty as figuring out the most efficient bus routes; Henderson reported his bussing procedures in 1965-66. There's been a lot of discussion about computer assisted instruction, in which the student actually interacts with the computer. For more on this read the Dick article (1970). Computer assisted instruction is distinct from the newer computer managed instruction reported by Kooi and Geddes, (1970), where the computer is used to record progress and branch a student to appropriate work. Individually prescribed instruction, IPI, is one type of computer managed instruction which has grown despite some criticism of the large consumption of paper. Divoky reported on this in 1969. Still different is Comprehensive Achievement Monitoring, CAM, which keeps detailed records on the achievement of individual students, on many objectives of a course, at many points during the course, and prints out a learning profile for groups of students. Bill Gorth and I wrote a major report on this last year.

Now, for counselors, I'd like to describe several specific, operational computer applications in counseling or useful to counselors.

The Ventura, California system reported by Rolens and Wagstaff in 1967 is the most comprehensive information system I've seen. Here's a list of some of the reports and forms from the system, useful to counselors, and available with little or no effort on the counselor's part (see Figure 1).

These are some of the services available from NEEDS, a subsidiary of Westinghouse Learning Corporation (see Figure 2). Using NEEDS gets away from a large capital investment, but then the school doesn't have the full-time use of the information system as does the Ventura School.

Course selection is another function which has been computerized for some time; Cogswell and Estavan did a report on this in 1965. Here's a brief look at a computer interview (see Figure 3).

As Cooley in 1969 and some others have said, "Good decisions need good information," and I might add,"Some decisions need much more information than other decisions." Do we even know how much information a high school student needs to make a good vocational decision? (Or shall we say some vocational decision at that point in time.) How well-informed can one counselor be today on the characteristics of all the possible jobs, the market for those jobs, the characteristics of all the educational systems relating to all the jobs, and last but not least, the expectancy tables of success for students with various characteristics in the various jobs, - and keep up with the changes in all these topics.

The current sources of information for the average counselor are probably two or three file drawers of occupational information, a shelf full

of college catalogs, and his own or vicarious experiences. Cooley in 1969 listed one more source: the "I would imagine machine." A client comes along and asks, "Should I get an M.S. in Business Administration or should I get some experience first?" The counselor, for lack of better information says, "Well, I would imagine...." and takes off on his biases.

Lovell in 1969 described a system called SELECT, for which a student, assisted by his counselor, fills out a lengthy questionnaire concerning his own characteristics, and the things he wants in his college, and after a computer 'run' he gets a list of schools based on these factors.

Harris (1968a, 1968b) reported on a system which is currently operational and is almost independently supported by the school district, in Villa Park, Illinois. Six hundred fifty occupations are classified in Anne Roe's (1956) occupational classification scheme (see Figure 4). With a student data base, an occupational data base, and an interactive communication through a typewriter system, the student can explore occupations appropriate to his level of ability and his profile of interests. The student information includes class rank, a composite score on the Scholastic Testing Service's Educational Development Series, and the Kuder Preference Record Scores. The relationship of these data to Roe's classification scheme is found in Figure 5. After the student is introduced to the vocations, Roe's classification scheme, and the meaning of Kuder scores, the computer requests interactively that the student rate himself, one step at a time, on 1) learning ability, 2) class rank, 3) interest areas, and 4) post high school plans (basically the amount of further education). The computer responds to this last step with either an "ok message" or a message indicating a minor or major discrepancy between the student's plans and his ability. You can find actual interview scripts in any of the Harris references. Once the student has made a selection of interest category and training level, the computer prints out the list of occupations that fall in that 'box!' This list may vary from none at all to seventy-five. If the student wants to explore any occupations on this list, he can type one in and receive a fifty-word description of that occupation. Then he might pursue characteristics of that occupation, or ask for a description of another one. Occupational characteristics stored in memory are fairly standard, including job duties, training requirements, recommended courses, working conditions, beginning salary range, and employment outlook, as well as references for further information. By means of a terminal hookup, the counselor can call for any of this same information with various codes. He can also call for information about colleges, scholarships, local technical and trade schools, and local entry jobs. The computer keeps track of the path of decision-making for each student, and this can be recalled by the counselor. The counselors routinely receive a "daily list of counselees who have received minor and major discrepancy messages on the system during the day [Harris, 1968b, p. 19]." Harris includes future plans for improving and evaluating the system in the same article.

The primary role and objective of all these systems, to quote the Palo Alto Unified School District Guidance Department, is to "help students make good decisions. Good decisions are based on a knowledge of the alternatives

and an understanding of the implications of each alternative." (Tondow and Betts, 1967?) Computer assisted counseling and guidance supports and supplements what the counselor does. It takes on the information-processing functions of the counselor, such as assessing, processing and supplying useful information. This frees him to emphasize the interpersonal relationship.

Impellitteri at Penn State likes the term "guidance support system." He also feels that vocational guidance aids are more important than educational or personal guidance aids, because the typical middle class counselor is unwilling to tackle the maze of career development (Impelletteri, 1969). Perhaps this hesitancy is quite understandable in view of the rapidly changing nature of the world of work.

Many people criticize use of the computer because they've been given short shrift at some time or another in their dealings with an organization. "In the computer you're just a number." But I hasten to point out that, by necessity, human beings run the computers and give them their instructions. The "runarounds" that come from "the computer" are human runarounds. The computer is just a tool, a machine. People sometimes use the computer as an excuse to abdicate their responsibilities, or else the computer has not been programed properly to deal with critical exceptions to routine transactions. But on the whole, the computer can give much more individual attention than is possible with the limited information storage, retrieval, and processing capabilities of the human mind. The computer, as other tools, makes work easier, gives some short-cuts, uses more variables in more complex functions to give more valid feedback, and does this all more quickly. IBM, in its ad, says "machines should work; people should think."

Several problems come to mind as I consider computer implementation in a school. One is cost. The cost of the CVIS system, which at last report is now locally supported (after a grant that got it started), is about $9,000 per month for lease of the equipment (Perrone and Thrush, 1969). This includes an IBM 360/30 with fifteen cathode ray tubes. If the terminal were used eight hours a day for five days a week, the cost per terminal hour comes out about $3.70. A local junior college is integrated into the system, so it may be possible that the terminals operate on 13 hour days, for five days. This would make the cost $2.35 an hour. Either of these hourly rates is below a counselor's rate.

Brisley, in "When should schools mechanize" (Kaiman and Marker, 1967) points out "In considering the cost of any new system or new equipment, the cost is not the amount of the investment, but rather the cost of operation, which would continue and . . . rise, if the changes were not made [p. 262]."

There have been two equipment companies funded by the federal government to research ways to get the cost of terminal time down to 40¢ per hour, for CAI applications. This will be some time in the future, but even a cost of two or three times that amount will be a possibility for most school systems.

There are some problems in keeping the vast amounts of information current. However, it is feasible; but it's impossible for one counselor to keep it all in his head. Most school systems working on some form of com puter-assisted counseling try to include in their programing the pooled knowledge and expertise of the various counselors in the school, so that anyone using the computer benefits from all.

Since a computer-assisted counseling system is implemented for the students in a given, local area, it turns out that that system (and the information it contains) needs to be tailor-made for those students. It is for this reason that Impellitteri (in Scates, 1969) makes an important plea for counselor involvement at all stages of system development. He says, "Counselors must be capable of developing their own guidance support systems to suit their own particular needs. . . The future of guidance will depend upon the ability of counselors to do this job for themselves. . .(p 119)." This short article, entitled "Implementation Problems: Counselor Acceptance of Systems," is a highly stimulating article and I heartily recommend it.

Maloney (1969), from the manufacturing industry (IBM), notes the disparity between the potential and the performance of the computer in education. He has the same answer; "Educators must become involved and knowledgeable about the alternatives, so that they may use their computer resources and spend their computer dollars in ways that will best further their own needs and aims(p 225)." He continues, "If educators will involve themselves in these decisions, will look on the technology as their own, and will clearly indicate to vendors where they want the emphasis to lie, they will set a direction to which the vendors can respond. There is no question that such direction setting will (1) induce vendors to increase their investment in equipment specifically designed for educational use; and (2) will further the partnership between education and data processing (p 229)."

Two books to help you get involved: Stoker (1968) is a good "quickie" in basic concepts of data processing. Awad (1966) is a much broader book, based on views of manufacturers, users, and educators. It covers systems design and equipment, as well as punched card processing and electronic data processing.

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[1]To accompany a paper presented in "Computer Applications to Counseling," a panel presented at the annual meeting of the New England Educational Research Organization, Boston, June 4-5, 1970.

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Figure 1

(Rolens and Wagstaff, 1967)

LIST OF INFORMATIONAL REPORTS USEFUL TO THE COUNSELOR

Ventura Unified School District Student Data System

Student Programs

Attendance Catalogs

Student Program Catalog

General Information Catalog

Statistical Summary

Notice to Parents

Notice to Parents Analysis

Mid-semester Progress Reports

D-F Rosters

Semester Grade Report Transcript Labels

G.P.A. Rank Order Listing of Students

Test Distributions

Interpretation of Test Data

Scheduling Pre-registration
- Rank order by I.Q.; by grade
- Above 114 I.Q. list
- Below 95 I.Q. list
- List two grade placements below expectancy

Course rank order list (to choose text)

Figure 2

Contents

Introduction to the New England Education Data Systems

Contents

Automated Student Accounting
Page 6

Mark Reporting
Page 9

Student Behavior Description (Trait Analysis)
Page 12

Scheduling: 1. Assignment of Students to Classes
Page 14

Scheduling: 2. Timetable Construction
Page 18

Test Scoring & Analysis
Page 23

Cooperative English Test	*27*
Iowa Test of Basic Skills	*28*
Iowa Tests of Educational Development	*28*
Metropolitan Achievement Tests	*29*
Sequential Tests of Educational Progress	*31*
Stanford Achievement Tests	*31*
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Differential Aptitude Test	*33*
Kuhlman–Anderson Test	*34*
Lorge–Thorndike Test	*35*
Otis–Lennon Mental Ability Tests	*35*
Otis Quick–Scoring Mental Ability Test	*36*
School and College Ability Tests	*36*

Figure 3

(Cogswell, 1965)

```
**** YES
ARE YOU HAVING ANY PROBLEMS WITH ANY OF THESE COURSES?
PLEASE TYPE YES OR NO.

**** YES
TYPE THE NUMBER OF EACH COURSE THAT IS GIVING YOU TROUBLE.
TYPE   CR  AFTER EACH NUMBER.
WHEN YOU ARE ALL THROUGH, TYPE   /  AND   CR.

**** 4

**** /
WHAT KIND OF PROBLEM DO YOU HAVE WITH  EUROPEAN HISTORY
PLEASE TYPE IN THE NATURE OF THE PROBLEM.  A FEW WORDS WILL BE O.K.
WHEN YOU ARE ALL FINISHED, TYPE   /  AND   CR.

**** I DON'T TURN MY WORK IN ON TIME./
I SEE...
IF YOU WOULD LIKE TO DISCUSS THIS PROBLEM FURTHER,
MAKE AN APPOINTMENT TO SEE YOUR COUNSELOR.

WOULD YOU LIKE TO CONTINUE WITH THIS INTERVIEW AT THIS TIME, OR WOULD
YOU LIKE TO DISCUSS YOUR PROBLEMS WITH YOUR COUNSELOR BEFORE YOU CONTINUE?
TYPE  GO  IF YOU'D LIKE TO CONTINUE.  TYPE  STOP  IF YOU'D LIKE TO STOP.

**** GO
DO YOU PLAN TO CONTINUE YOUR FORMAL EDUCATION BEYOND HIGH SCHOOL?

**** YES
WHICH OF THE FOLLOWING IS MOST LIKE THE SCHOOL YOU PLAN TO ATTEND?
1  IVY LEAGUE COLLEGE
2  OTHER COLLEGE OR UNIVERSITY
3  CALIFORNIA STATE COLLEGE
4  JUNIOR COLLEGE
5  BUSINESS OR VOCATIONAL SCHOOL
6  I HAVE NOT YET DECIDED
TYPE THE APPROPRIATE CODE.

**** 3
DO YOU INTEND TO MAJOR IN ENGINEERING OR ONE OF THE SCIENCES?
PLEASE TYPE YES OR NO.

**** YES
HERE ARE SOME AREAS OF SCIENCE AND SOME EXAMPLES

 CODE    AREA                                  EXAMPLES
   1     PHYSICAL SCIENCES.....PHYSICS, CHEMISTRY, GEOLOGY, ETC.
   2     BIOLOGICAL SCIENCES...BIOLOGY, PRE-MED, PRE-NURSING, ETC.
   3     SOCIAL SCIENCES.......PSYCHOLOGY, SOCIOLOGY, ANTHROPOLOGY, ETC.
   4     MATHEMATICS...........MATH, STATISTICS, COMPUTER PROGRAMMING, ETC.
   5     ENGINEERING...........ARCHITECTURE, DRAFTING, ELECTRONICS, ETC.
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Figure 3 (con't)

PLEASE TYPE THE CODE NUMBER OF THE KIND OF SCIENCE YOU INTEND
TO MAJOR IN.

**** 3
ALRIGHT. LET'S SEE IF WE CAN PINPOINT YOUR AREA
1 PSYCHOLOGY
2 SOCIOLOGY
3 ANTHROPOLOGY
4 SOCIAL WORK
TYPE THE APPROPRIATE CODE.

**** 1
OK.....
THE GRADES YOU GET IN HIGH SCHOOL LARGELY DETERMINE THE TYPE OF
COLLEGE YOU WILL BE ABLE TO ATTEND.
LET'S JUST TAKE A LOOK AT YOUR PROJECTED HIGH SCHOOL GRADES
BASED ON YOUR PRESENT PERFORMANCE.
STUDENTS WHO GOT GRADES LIKE YOURS IN JUNIOR HIGH,
DID AS FOLLOWS AT CUBBERLEY---

70 PER CENT EARNED A OR B
20 PER CENT EARNED C+
10 PER CENT EARNED C

ON THE BASIS OF YOUR PROJECTED GRADES, YOUR PRESENT COLLEGE CHOICE
INDICATES THAT YOU ARE THINKING PRETTY REALISTICALLY ABOUT YOUR
FUTURE LIFE.

NOW THAT WE'VE GOT SOME IDEA OF WHAT YOU'D LIKE TO DO
AFTER HIGH SCHOOL, LET'S LOOK AT YOUR HIGH SCHOOL COURSE PLANS.
IN THE 10TH GRADE, THE REQUIRED COURSES ARE---

ENGLISH 2
CONTEMPORARY WORLD HISTORY AND GEOGRAPHY
PHYSICAL EDUCATION

WHAT OTHER COURSES WOULD YOU LIKE TO TAKE NEXT YEAR?
LOOK AT THE LIST OF COURSES.
WHEN YOU HAVE DECIDED WHAT COURSES YOU WANT TO TAKE, TYPE YES.
IF YOU CAN'T MAKE UP YOUR MIND AT ALL TYPE NO

**** YES
GOOD.
TYPE THE CODE NUMBER OF EACH COURSE YOU WANT TO TAKE.
TYPE CR AFTER EACH NUMBER.
WHEN YOU ARE ALL THROUGH, TYPE / AND CR.

Figure 4 (Harris, 1968)

At the time Roe published her book, she classified approximately 350 occupations in this way. In 1966, Dr. Roe and her associates at Harvard reworked the list of occupations in accordance with the new *Dictionary of Occupational Titles*, and the new list consists of 650 occupations. An example of the classification system follows:

LEVEL	SERVICE	BUSINESS CONTACT	ORGANIZATION	TECHNOLOGY	OUTDOOR	SCIENCE	GENERAL CULTURAL	ARTS & ENTERTAINMENT
I	PSYCHIATRIST PSYCHOLOGIST					ANTHROPOLOGIST OCEANOGRAPHER	ECONOMIST LAWYER	ARCHITECT
II	SOCIAL WORKERS COUNSELORS	PUBLIC RELATIONS WORKER	HOSPITAL ADMINISTRATOR, C.P.A.	AIRPLANE PILOT ENGINEER	SURVEYOR, LANDSCAPE ARCHITECT	NURSES, R.N. PHARMACISTS	CLERGYMEN, TEACHERS, H.S. & ELEM.	ACTOR ACTRESS DESIGNER
III	POLICE CHIEF, RECREATION WORKER	SALES, AUTO, INSURANCE	HOTEL MANAGER, STENOGRAPHER	DRAFTSMAN, FLIGHT ENGINEER	FOREST RANGER, COUNTY AGENT	DENTAL HYGIENIST, X-RAY TECHNICIAN	RADIO ANNOUNCER, TV ANNOUNCER	INTERIOR DECORATOR, PHOTOGRAPHER
IV	POLICEMEN, PRACTICAL NURSES	DRIVER-SALESMAN	BOOKKEEPER SALESCLERKS	ELECTRICIAN JEWELER	FORESTRY TECHNICIAN, MINER	LAB TECHNICIAN, OPTICIAN		LETTERER, PASTE-UP MAN
V	TAXI DRIVER, WAITER		TYPISTS, CASHIERS	TRUCK DRIVER PLASTERER	CHAINMAN, ROUSTABOUT			
VI	ORDERLY, BELLMAN		MAIL MACHINE OPERATOR, SORTING MACH. OP.	BULLDOZER OPERATOR, CEMENT MASON	ROUSTABOUT, LUMBERJACK			PINBOY

Figure 5 (Harris, 1968)

CVIS

III RELATIONSHIP OF THE STUDENT RECORD

CUMULATIVE RANK IN CLASS		1	2	3	4	5	6	7	8	COMPOSITE TEST BATTERY SCORE (%)
TOP ONE QUARTER	I									TOP QUARTILE (76-97%)
1ST-2ND QUARTER	II									1ST-2ND QUARTILE (51-99%)
2ND-3RD QUARTER	III									2ND-3RD QUARTILE (26-75%)
2ND-3RD QUARTER	IV									2ND-3RD QUARTILE (26-75%)
3RD QUARTER	V									3RD QUARTILE (25-50%)
4TH QUARTER	VI									4TH QUARTILE (1-25%)
KUDER		SOCIAL SERVICE	PERSUASIVE	CLERICAL COMPUTATIONAL	SCIENTIFIC MECHANICAL COMPUTATIONAL	OUTDOOR	SCIENTIFIC	LITERARY	ARTISTIC MUSICAL LITERARY	

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